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EXAMINER

VINH, L

ART UNIT

PAPER NUMBER

1765

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/002,007

Applicant(s)
Jeffrey Hung et al.

Examiner
Lan Vinh

Group Art Unit
1765

☒ Responsive to communication(s) filed on 10/13/00

☒ This action is FINAL.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-13 and 16-22 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-13 and 16-22 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4, 6, 7-12, 17, 18, 20, 21-22 are rejected under 35 U.S.C 103(a) as being unpatentable over Abraham et al. (US 5,883,007) in view of Tsai et al. (US 5,753,418).

Abraham discloses a method for improving photoresist selectivity and reducing etch rate loading. This method comprises the steps of etching a photoresist layer covering the ARC (antireflective coating) layer to expose area of the ARC layer on a metallic layer (col 4, lines 39-41 and fig. 1), etching by exposing the exposed area of ARC layer to an oxygen-free agents inherently in an ionized state in a plasma chamber, the etching agents includes one fluorine compound CHF_3 , Chlorine and an inert gas of Ar (col 6, lines 34-36).

Abraham differs from the instant claimed invention as per claim 1 by etching an inorganic ARC layer (TiN).

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However, Tsai discloses a method for forming patterned layer within an integrated circuit comprises the step of etching an organic layer using oxygen-free etching agents includes fluorine carbon and argon (col 6, lines 46-54).

One skilled in the art would have found it obvious to substitute Abraham's inorganic layer with an organic ARC layer as per Tsai because organic ARC layer can be spin-applied thus providing uniform thickness of the ARC layer and improving etch selectivity during etching process.

Regarding claim 4, Abraham discloses using the system of etching agents consists essentially of CHF_3 / Ar / Cl_2 (col 6, line 36).

Regarding claims 7, 18, 21, Abraham recites keeping the pressure about 0.5 mTorr (below 100 mTorr) within the chamber (col 58-59).

Regarding claims 8-9, Abraham discloses the plasma device comprises an ECR reactor and the ARC layer is on a semiconductor wafer (col 5, lines 21-33).

Regarding claim 10, Abraham discloses that the RF energy may be coupled inductively through an inherent antenna outside the chamber to sustain the plasma chamber (col 4, lines 64-67).

3. Claims 16, 19 are rejected under 35 U.S.C 103(a) as being unpatentable over Abraham et al. (US 5,883,007) in view of Tsai et al. (US 5,753,418) and further in view of Bariya et al. (US 5,443,941).

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Abraham and Tsai have been described above in paragraph 2. Unlike the instant claimed invention as per claims 16, 19, Abraham and Tsai do not specifically disclose using polyimide as the organic ARC.

However, Bariya discloses that polyimide is a organic ARC (col 2, lines 3-5).

One skilled in the art would have found it obvious to modify Abraham and Tsai by using polyimide as the organic ARC layer as per Bariya because the polyimide, or organic ARC layer, is easier to form on the substrate through spin-coating method thus reducing the processing time.

4. Claims 5, 13 are rejected under 35 U.S.C 103(a) as being unpatentable over Abraham et al. (US 5,883,007) in view of Tsai et al. (US 5,753,418) and further in view of the following:

Abraham as modified by Tsai has been described above in paragraph 2. Unlike the instant claimed invention as per claims 5, 13, Abraham and Tsai fail to disclose the following aspect of applicant's claimed invention: the specific etchant gases flow rates.

However, it is the examiner's position that one skilled in the art would have found it obvious to employ any of a variety of gas flow rates including those claimed by the applicant because etchant flow rate is a well known variable in the plasma etching art which are known to effect the plasma etching process. Further, the selection of particular flow rates would simply involve routine experimentation.

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Response to Arguments

5. Applicant's arguments filed on 10/13/2000 have been fully considered but they are not persuasive.

It is argued that the examiner has not identified any prior art reference establishing a reasonable expectation that an organic ARC can be etched with an etchant gas suitable for an inorganic ARC. The examiner disagrees because the reference of Abraham discloses that the first chemistry etching of CHF_3 , Chlorine and an inert gas of Ar (col 6, lines 34-36) used to etch an inorganic ARC of TiN may also be performed on **any** metallization-overlying layer (a layer that is disposed above the metallization layer) (col 6, lines 13-17) and it is well known in the art of IC fabrication that an ARC layer (inorganic or organic) is formed above a metallization layer. Therefore, it is the examiner's position that an organic ARC can be etched with an etchant suitable for an inorganic ARC.

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is (703) 305-6302. If attempts to reach the examiner are unsuccessful, the examiner's supervisor, Benjamin Utech, can be reached on (703) 308-3836. The official fax number for the organization is (703) 305-3599.


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December 4, 2000